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Abstract

Multiple recent studies report that measures of pathogen avoidance (e.g., disgust sensitivity) correlate with political ideology. This relationships have been interpreted as suggesting that certain political views (specifically, those views that are categorized as socially conservative) function to mitigate the pathogen threats posed either by intergroup interactions or departures from traditional societal norms, which sometimes evolve culturally for anti-pathogen functions. We propose and test the alternative hypothesis that pathogen avoidance relates to conservatism indirectly via sexual strategies (e.g., relatively monogamous versus relatively promiscuous). Specifically, we argue that individuals who are more invested in avoiding pathogens follow a more monogamous mating strategy to mitigate against pathogens transmitted during sexual contact, and individuals following a more monogamous mating strategy adopt socially conservative political ideologies to support their reproductive interests. Results from three studies (N's = 819, 238, and 248) using multiple measures of pathogen avoidance, sexual strategies, and ideology support this account, with sexual strategies fully mediating the relationship between measures of pathogen avoidance and conservatism in each study.

Keywords: Political attitudes, sexual strategies, pathogen avoidance, disgust, individual differences

Is the Relationship Between Pathogen Avoidance and Ideological Conservatism Explained by Sexual Strategies?

1.Introduction

In recent years, political scientists and social, personality, and political psychologists have contributed to a growing field of Evolutionary Political Science (Lopez & McDermott, 2012). Investigations in this area have used insights from evolutionary psychology to better understand preferences for political leaders (Spisak et al., in press) as well as positions on politically relevant issues such as recreational drug use (Kurzban et al., 2010), social welfare (Aarøe & Petersen, 2013), and progressive taxation (Petersen et al., 2013).

Attitudes toward discrete political issues such as these often bundle into packages and vary along dimensions referred to as ideological liberalism versus conservatism. Political scientists and psychologists argue that two primary dimensions underlie variation in ideology: 1) advocating for social change (left-wing) versus advocating for tradition (right-wing), and 2) advocating for equality between individuals and groups (left-wing) versus tolerating inequality (right-wing; for overviews, see Duckitt and Sibley, 2009; Jost et al., 2003, 2009). Much of the research investigating how and why individuals vary along these dimensions has concluded that ideological conservatism functions to generally neutralize or manage unpleasant sensations, such as those accompanying fear and uncertainty (Jost et al., 2003). Evolutionary approaches to ideology have similarly suggested that conservatism functions to neutralize threats, though they have emphasized specific, fitness-relevant threats rather than internally generated, phenomenological ones. We discuss two of these evolutionary perspectives here.

1.1.Pathogen avoidance and ideological conservatism

Researchers have suggested that certain elements of conservative ideology function at least in part to reduce individuals' exposure to infectious microorganisms (Inbar & Pizarro, 2014; Terrizzi et al., 2013). For individuals who are more invested in avoiding pathogens, the reasoning goes, the putatively pathogen-mitigating aspects of right-wing ideologies make these ideologies more appealing. Most of the support for this account comes from studies reporting a positive relationship between political attitudes and individual differences in pathogen avoidance. These studies typically operationalize pathogen avoidance using self-report instruments that either (a) ask participants to report the extent to which they agree with statements such as "I do not like to write with a pencil someone else has obviously chewed on" (referred to as "germ aversion" or "contamination sensitivity"); or (b) ask participants the degree to which they would be disgusted by experiences such as "stepping in dog poop" (referred to as "disgust sensitivity"). A recent meta-analysis of studies using these methods suggests that the relationship between pathogen avoidance and conservatism is statistically robust and moderate in size, r=.26 (Terrizzi et al., 2013).

Multiple potentially pathogen-neutralizing aspects of conservatism have been proposed to explain this empirical relationship. One account suggests that interactions with outgroup members might pose a greater pathogen threat than interactions with ingroup members if outgroups carry—and are adapted to—pathogens from different ecologies (see Thornhill and Fincher, 2014, for an overview). Given that ingroup favoritism is a hallmark of ideological conservatism (Duckitt & Sibley, 2009), researchers have proposed that variation in conservatism in part results from variation in effort to neutralize the putative pathogen threats posed by intergroup interactions (Terrizzi et al., 2013). Another account points out that cultural evolution

might favor traditions and rituals (e.g., in terms of hygiene or food preparation) that are adapted to neutralizing ecologically-specific pathogens (Billing & Sherman, 1998). Adherence to tradition—and advocating for others in the community to also adhere to tradition—might thus partially serve pathogen-neutralizing functions (Murray et al., 2011). Importantly, researchers favoring both of these explanations have suggested that only the *social* conservatism dimension (i.e., advocating for change versus favoring long-standing cultural traditions) reflects a pathogen avoidance strategy (Terrizzi et al., 2013). For example, Terrizzi and colleagues (2010) suggest that favoring versus disfavoring the legality of stem cell research, abortion, and medical marijuana use reflects pathogen avoidance, whereas opinions regarding minimum wage, environmental protection, and government-funded health care do not.

These accounts are consistent with empirical results showing bivariate relationships between conservatism and pathogen avoidance. However, a growing body of theory and research on the behavioral immune system suggests that myriad aspects of human psychology and behavior might serve anti-pathogen functions (Schaller & Park, 2011; Thornhill & Fincher, 2014). This raises the possibility that there are alternative accounts that might explain the empirical relationship between pathogen avoidance and conservatism. Here, we present and test such an alternative explanation—that the relationship between measures of pathogen avoidance and conservatism reflects sexual strategies.

1.2. Pathogen avoidance and sexual strategies

The costs imposed by pathogens have shaped the evolution of several aspects of human sexuality and mate preferences (Tooby, 1982; Ridley, 1993; Tybur & Gangestad, 2011) including, potentially, orientation toward monogamous versus promiscuous sexual strategies (Schaller & Murray, 2008). Each new sexual partner presents a risk of exposure to novel

pathogens, either those commonly categorized as "sexually transmitted" (e.g., chlamydia) or those that are transmitted via close physical contact, sexual or otherwise (e.g., influenza, tuberculosis). Indeed, across primate groups, those species with greater promiscuity also invest more energy in immune function, possibly to combat the pathogens transmitted during sexual contact (Nunn et al., 2000). If the pathogen costs are greater than the benefits of multiple sexual partners (including increased reproductive output for males and increased offspring genetic diversity or quality for females; see Buss & Schmitt, 1993), mating systems might evolve to be relatively monogamous (Loehle, 1995). Modeling simulations support this hypothesis, though they also suggest that, rather than leading to homogenous monogamy throughout a population, pathogen costs of sex can lead to increases in variability in monogamous versus promiscuous mating strategies, with some individuals favoring a pathogen-risky sexual strategy (non-monogamous) and others favoring a pathogen-risk-averse strategy (monogamous; Boots & Knell, 2002; Kokko et al., 2002).

Empirical investigations of humans are consistent with the idea that more pathogen-avoidant individuals adopt more monogamous mating strategies. For example, Murray and colleagues (2013) found that the Germ Aversion subscale of the Perceived Vulnerability to Disease scale (Duncan et al., 2009) relates negatively to short-term mating orientation (β=-.19), meaning that individuals who are more avoidant of situations that are likely to transmit pathogens are also less open to sex outside of a long-term, committed relationship. Similarly, the sexual and pathogen factors of the Three Domain Disgust Scale (TDDS; Tybur et al., 2009) are moderately correlated (β=.40), meaning that individuals who report being more disgusted by pathogen cues also report being more disgusted by a variety of sexual acts and situations outside of intercourse in a pair bond. Other research also indicates a relationship between pathogen

avoidance and sexual attitudes (e.g., Duncan et al., 2009; Olatunji, 2008). Hence, the same operationalizations of pathogen avoidance used in investigations of the relationship between pathogen avoidance and conservatism (i.e., disgust sensitivity and germ aversion; see Terrizzi et al., 2013) also relate to sexual strategies. And, as it happens, recent research suggests that sexual strategies may also relate to conservatism for reasons apart from pathogen avoidance.

1.3.Sexual strategies and ideological conservatism

Individuals following relatively monogamous versus relatively non-monogamous mating strategies are helped or harmed by different social rules (Weeden et al., 2008; Weeden & Kurzban, 2013). Rules that allow or even facilitate promiscuous sexual behavior in the social ecology threaten the fitness interests of individuals following monogamous, high investment reproductive strategies. Men who invest heavily in a single pair-bond have more to lose (e.g., via cuckoldry) if the social ecology presents more opportunities for mate poaching via "non-traditional" activities that present opportunities for casual, extra-pair sex (e.g., drug use, parties, sexual exploration; Kurzban et al., 2010), and women who are highly dependent upon a pair-bonded male's investment encounter similar threats in environments where promiscuous sexual behavior is condoned and partner resources might be reallocated from parenting effort to mating effort (Price et al., in press). Therefore, individuals following relatively monogamous mating strategies have a strategic interest in endorsing rules proscribing sexual promiscuity—rules that characterize many ideological aspects of social conservatism (Weeden & Kurzban, 2014).

Results from several studies are consistent with the sexual strategies hypothesis of conservatism. Using large U.S. samples, Weeden and colleagues (2008) and Kurzban and colleagues (2010) find that the causal path flows from sexual strategies to ideological conservatism rather than from ideological conservatism to sexual strategies. These empirical

patterns do not appear to be unique to the U.S.; indeed, they have been replicated in Japan, the Netherlands, and Belgium (Quintelier et al., 2013). Further, data from the World Values Survey, which includes nearly 300,000 individuals from 90 countries, indicate that religiosity consistently relates to endorsement of rules that facilitate or interfere with sexual strategies (e.g., casual sex, prostitution, sexual infidelity), whereas it does not uniquely relate to endorsement of rules unrelated to sexual strategies (Weeden & Kurzban, 2013). In the U.S., individuals living in communities in which females are more economically dependent on males find sexual promiscuity more wrong than individuals living in communities with greater sex egalitarianism (Price et al., 2014). Finally, Li et al. (2010) find that, in an American university sample, participants who view dating profiles depicting highly attractive members of their own sex (i.e., intrasexual competitors who could threaten investment in a monogamous mating strategy via mate poaching) endorse greater religiosity.

1.4.Do sexual strategies explain the relationship between pathogen avoidance and social conservatism?

There are, then, multiple possible explanations for the relationship between pathogen avoidance and social conservatism. We have proposed that individuals invested in avoiding infectious disease develop a high investment, relatively monogamous sexual strategy to mitigate the pathogen costs associated with increasing numbers of sexual partners. Investment in this sexual strategy then motivates a suite of socially conservative attitudes that are strategically advantageous for those who have invested in monogamous pair bonds (we call this the *sexual strategies* account of the relationship between pathogen avoidance and social conservatism). Some existing evidence is consistent with this account. One recent study found that, out of attitudes toward 14 groups, the Disgust Scale Revised (Olatunji et al., 2007) related most

strongly to attitudes toward groups that were seen as violating or promoting traditional sexual rules (Crawford et al., 2014). Other studies that have been interpreted as supporting the pathogen avoidance function of social conservatism are also consistent with this account. For example, although resistance to stem cell research, abortion, and homosexual marriage has been interpreted as a strategy for socially excluding outgroups who pose pathogen threats (Terrizzi et al., 2010), other accounts suggest that such attitudes serve strategic reproductive functions (Weeden & Kurzban, 2014). Hence, the existing empirical relationship between pathogen avoidance variables and social conservatism variables could reflect a shared relationship between pathogen avoidance and sexual strategies.

Naturally, the pathogen avoidance and sexual strategies explanations need not be mutually exclusive—in fact, to the extent that people have coherent political ideologies, political sentiments related and unrelated to sexual strategies might covary (Jost et al., 2003, 2009). However, a strong version of the sexual strategies account, according to which the relationship between pathogen avoidance and conservatism is entirely due to sexual strategies, makes a testable prediction about the relationship between these variables. Namely, if this account is correct, then sexual strategies should fully mediate the relationship between pathogen avoidance and conservatism—that is, there should be no residual relationship between pathogen avoidance and social conservatism after accounting for sexual strategies. In contrast, if conservatism functions to neutralize pathogens in the ways detailed above, then pathogen avoidance should relate to conservatism independently of sexual strategies. There are myriad ways of interacting with and acquiring pathogens from outgroups that are seemingly unrelated to sex (e.g., exchanging goods), and there are myriad traditions (e.g., food preparation) that are similarly unrelated to sex. Further, individuals following more versus less monogamous sexual strategies

would seemingly face the same threat of pathogens from outgroups or deviations from tradition. Hence, this perspective can be used to predict that individual differences in pathogen avoidance would covary with the residual variation in social conservatism not accounted for by sexual strategies.

We aim to test these accounts across three studies by using a broad array of measures of pathogen avoidance, sexual strategies, and ideological conservatism.

2.Study 1

Much of the literature on pathogen avoidance and conservatism operationalizes pathogen avoidance using disgust sensitivity instruments. Indeed, even before the term "behavioral immune system" entered the evolutionary psychological lexicon, political psychologists suggested that conservatives are disgusted more easily than liberals (Jost et al., 2003). Hence, we began our investigation by examining the relationship between conservatism and disgust sensitivity. We chose to use the TDDS as a measure of disgust sensitivity, since it includes separate pathogen and sexual disgust factors.

This investigation is similar to that described by Tybur and colleagues (2010), with two important modifications. First, whereas Tybur and colleagues surveyed only undergraduate university students, this study surveyed a larger sample of individuals with a broader range of ages, educational background, and geographic locations. Second, in contrast with Tybur and colleagues, who used broad measures of ideological conservatism that did not differentiate between social conservatism and economic conservatism (e.g., level of agreement with the statement "I consider myself to be politically liberal"), we separately asked participants how liberal versus conservative they are on economic and social issues. Although endorsements of "social" and "economic" conservatism are correlated, they differentially relate to personality

variables (Gerber et al., 2010), and they might differentially relate to reproductive or pathogen avoidance strategies (Weeden & Kurzban, 2014). Indeed, this shortcoming (i.e., not differentiating between social and economic conservatism) has cast doubt on the validity of results reported by Tybur and colleagues for testing the pathogen avoidance hypothesis of conservatism (see Terrizzi et al., 2013).

2.1.Methods

Participants were 819 adults (423 male; M_{age}= 33.37, *SD*=12.33) recruited via Mechanical Turk, the SPN network website, and the Psychology Research on the Net website. Only Mechanical Turk users registered in the United States were allowed to participate. Further information about our samples can be found in the supplementary materials (see also Berinsky et al., 2012, and Paolacci et al., 2010, for more details on Mechnical Turk users). After completing other measures irrelevant to the current investigation, participants completed the following:

Three Domain Disgust Scale (Tybur et al., 2009): This is a 21-item measure that includes a seven-item *pathogen* factor, a seven-item *sexual* factor, and a seven-item *moral* factor. The pathogen factor of the TDDS has frequently been used to operationalize pathogen avoidance (e.g., Debruine et al., 2010; Park et al., 2012), and the sexual factor has been used to test sexual strategies hypotheses (e.g., Kurzban et al., 2010; Quintelier et al., 2013) and shows similar sex differences and correlations with personality traits as other measures of sexual strategies (see Tybur et al., 2011; Tybur & DeVries, 2013; compare with Bourdage et al., 2007). We only included scores on the pathogen (α = .84) and sexual (α = .88) factors.

Individual ideology items: Participants answered three questions concerning ideology:

1) How would you describe your political orientation when it comes to social issues?

2) How would you describe your political orientation when it comes to economic issues?

3) Do you tend to agree more with the Democratic Party or with the Republican Party? Each of these items was measured on a seven point, likert-type scale. The first two items were anchored by "Very Liberal" and "Very Conservative." The third item was anchored by "Much more with Democrats" and "Much more with Republicans."

2.2.Results

Consistent with past findings that pathogen avoidance is related to social conservatism, we found that social conservatism related to the pathogen domain of the TDDS (r=.16, p<.05). Lee and Preacher's (2013) test for differences between dependent correlations suggested that this relationship was stronger than those between the pathogen domain of the TDDS and economic conservatism (r=.08, p<.05) and agreement with the Democratic versus Republican parties (r=.09, p<.05). The sexual domain of the TDDS also related to all conservatism variables, though the magnitudes of the correlations were stronger (r's=.34, .16, and .19, p's<.05, for social conservatism, economic conservatism, and party identification, respectively).

We used structural equation modeling (via EQS 6.1) to test the sexual strategies account of the relationship between pathogen avoidance and conservatism. This approach allows for a direct statistical comparison of models in which effects of pathogen avoidance on conservatism operate only via sexual strategies (i.e., mediation hypotheses) versus models in which pathogen avoidance relates to conservatism independent of sexual strategies. Our approach involved specifying a model in which (1) the sexual domain of the TDDS was regressed on participant sex and the pathogen domain of the TDDS and (2) the three conservatism variables were regressed onto participant sex and the sexual domain of the TDDS. Participant sex and the pathogen domain of the TDDS were allowed to covary, as were error variances between conservatism items (that is, variance in ideology items that was not accounted for by participant sex or the

sexual domain of the TDDS). Hence, the only relationships that were not modeled were direct effects of pathogen avoidance on conservatism (that is, the direct relationships between pathogen avoidance and conservatism were constrained to zero). A poor-fitting model would suggest that pathogen avoidance relates to conservatism independently of its relationship with sexual strategy. A well-fitting model would provide support for the strong version of the sexual strategies hypothesis–that pathogen avoidance relates to conservatism only because it relates to sexual strategies. As is standard in structural equation modeling, a significant chi-square value rejects the null hypothesis that the covariance matrix implied by the model is identical to the covariance matrix observed in the data. Other model fit indices, including comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR) are also routinely reported, since significant chi square values can result from trivial misfit. All statistics are based on robust maximum likelihood estimates, which correct for biases that might occur under violations of multivariate normality (Bentler, 2006).

-- Figure 1 here --

The model fit the data well, regardless of which criterion was used to evaluate model fit, S-B $\chi^2(3)=1.56$, $p=.67$, CFI=1.00, RMSEA=.00, SRMR<.01. That is, the model in which direct relationships between the pathogen domain of the TDDS and the three conservatism items were constrained to zero was statistically indistinguishable from the observed data (see Figure 1 for standardized coefficients). Each of the three indirect effects of the pathogen domain of the TDDS on conservatism via the sexual domain of the TDDS was statistically significant at the $p<.05$ level (see supplementary materials for effect sizes). To illustrate the independent effects of pathogen avoidance on conservatism, we also examined a saturated model in which direct effects from pathogen avoidance to conservatism were freely estimated. Consistent with the near perfect

fit of the constrained model, all of these coefficients were close to zero (β's=-.01, .02, and -.02 for social conservatism, economic conservatism, and party affiliation, respectively), with 95% confidence intervals that overlapped with zero (see Table 1).

-- Table 1 here --

2.3.Discussion

Results from Study 1 offered initial support to the sexual strategies account of the relationship between pathogen avoidance and conservatism, and were not straightforwardly consistent with alternative accounts. However, two aspects of Study 1 might have limited our ability to detect a relationship between pathogen avoidance and conservatism independent of sexual strategies. First, the variables we used to measure conservatism explicitly mentioned political attitudes and political party affiliation. Substantial variance in these items might have related to issues (e.g., firearm regulations) only peripherally related to the purported prophylactic aspects of conservatism. Other constructs that more directly relate to intergroup bias or traditionalism might relate to pathogen avoidance independently of sexual strategies. Second, we used only one of several measures that have been used to operationalize pathogen avoidance in this literature—the pathogen domain of the TDDS. We address these two limitations in Study 2.

3.Study 2

Given the limited breadth of conservatism measures included in Study 1—and the sole reliance on the TDDS to operationalize pathogen avoidance—we broadened our coverage of both constructs in Study 2. Specifically, we included (1) the Disgust Scale-Revised (DS-R), another instrument that is commonly used to operationalize pathogen avoidance in this literature, and (2) instruments to measure religiosity, traditionalism, and tolerance of inequality, the latter two of which are considered to be core dimensions of ideological conservatism (Jost et al.,

2003), and both of which relate to negativity toward outgroups (Duckitt & Sibley, 2009). Measures of religiosity, traditionalism, and social dominance orientation have been used in several of the studies testing for relationships between pathogen avoidance and social conservatism (Terrizzi et al., 2013).

3.1.Methods

Participants were 238 adults (100 female; M_{age}=32.75, SD=11.00) recruited via Mechanical Turk. After completing other measures irrelevant to the current investigation, participants completed the TDDS (pathogen α=.89; sexual α=.89) and the following instruments:

Disgust Scale-Revised (DS-R; Olatunji et al., 2007): Olatunji and colleagues modified the Disgust Scale (Haidt et al., 1994) by removing seven items, including the four items that were originally intended to form a "sexual" factor. Thirteen items ask participants to indicate the degree to which they agree with statements such as "It would bother me tremendously to touch a dead body" on a 1 (strongly disagree) to 5 (strongly agree) likert scale, and 12 items ask participants how disgusting they find statements such as "A friend offers you a piece of chocolate shaped like dog doo" on a 1 (not disgusting at all) to 5 (extremely disgusting) scale (α=.89).

Social Dominance Orientation (Pratto et al., 2013): This is a four-item measure in which participants indicate the degree to which they oppose versus favor statements (e.g., "Group equality should be our ideal") on a 1 (*extremely oppose*) to 7 (*extremely favor*) likert scale (α=.82).

Traditionalism (Duckitt et al., 2010): This is a six-item measure of traditionalism in which participants are asked to indicate their agreement with statements such as "The 'old-

fashioned ways' and 'old-fashioned values' still show the best way to live" on a 1 (strongly disagree) to 7 (strongly agree) scale (α=.90).

Religiosity: We also included three religiosity items recently used in an international Pew Research Survey. Participants indicated "no" (which was coded as 0) or "yes" (which was coded as 1) to the following items: "I believe faith in God is necessary for morality," "Religion is very important to my life," and "I pray at least once per day." Item responses were averaged (α=.91).

Individual ideology items: As in Study 1, participants answered individual items that straightforwardly asked them to self-report their ideology. In contrast to Study 1, the "social" and "economic" conservatism items did not explicitly mention "politics." The four items were:

1) In general, how liberal (left-wing) or conservative (right-wing) are you on economic issues?

2) In general, how liberal (left-wing) or conservative (right-wing) are you on social issues?

3) When it comes to politics, do you usually think of yourself as liberal, moderate, conservative, or something else?

4) In political matters, people talk of "the left" and "the right." How would you place your views on this scale?

The first and second items were measured on a 1 (very liberal) to 7 (very conservative) scale with additional options for "don't know" and "can't pick one label." The third item was measured on a 1 (very liberal) to 7 (very conservative) scale with additional options for "don't know/not political," "libertarian," and "other." The fourth item was measured on a 1 (left) to 10 (right) scale, with an additional option for "Don't know/not applicable." We treated responses from participants who selected one of these additional options (between five and ten percent of

responses, depending on the item) as missing data. These missing values were imputed using the EQS EM algorithm for estimating missing data by considering participants' social dominance orientation, traditionalism, age, sex, and the four political ideology items. Results were unchanged when missing values were not imputed.

3.2. Results

We report analyses using both the pathogen domain of the TDDS and the DS-R separately, with the TDDS correlation before the slash and the DS-R correlations after. Both instruments were related to social conservatism (r=.23/.22, p's<.05), economic conservatism (r=.15/.14, p's<.05), left versus right placement (r=.19/.23, p's<.05), general political identification (r=.22/.22, p's<.05), traditionalism (r=.25/.36, p's<.05), social dominance orientation (r=.08/.13, p's=.23/.05), and religiosity (r=.26/.34, p's<.05). As in Study 1, though, the sexual domain of the TDDS was more strongly correlated with each measure of conservatism than were either the DS-R or the pathogen domain of the TDDS (see Table 2).

-- Table 2 here --

We proceeded to test path models similar to that described in Study 1. We tested two models separately—one in which the DS-R was used to operationalize pathogen avoidance, and one in which the TDDS pathogen domain was used to operationalize pathogen avoidance. In both models, we (1) regressed the sexual domain of the TDDS on participant sex and the pathogen avoidance variable, and (2) regressed all seven ideology variables on the sexual domain of the TDDS and on participant sex. Participant sex and pathogen avoidance were allowed to covary, as were all error variances of conservatism items. Hence, as in Study 1, the model did not allow any direct effects of pathogen avoidance on conservatism; it only allowed pathogen avoidance to relate to conservatism indirectly via the sexual domain of the TDDS.

Replicating results from Study 1, the model in which pathogen avoidance was operationalized using the TDDS pathogen domain—and in which direct relationships between pathogen avoidance and conservatism were constrained to zero—fit the data well, S-B $\chi^2(7)=10.84$, $p=.15$, CFI=1.00, RMSEA=.05, SRMR=.02. Results were virtually identical when the DS-R was used, S-B $\chi^2(7)=9.80$, $p=.20$, CFI=1.00, RMSEA=.04, SRMR=.02. All indirect effects of pathogen avoidance variables via the sexual domain of the TDDS were statistically significant (see supplementary materials for effect sizes). As in Study 1, we also examined saturated models in which all direct relationships between pathogen avoidance and conservatism variables were freely estimated. Only one of the 95% confidence intervals for these direct effects failed to overlap with 0 (that between the pathogen domain of the TDDS and traditionalism), and this effect was in the opposite direction of that predicted by the pathogen avoidance model. In sum, any positive relationships between pathogen avoidance variables and conservatism were, as in Study 1, fully mediated by the sexual domain of the TDDS.

3.3.Discussion

Results from Study 2 provided further support for the strong version of the sexual strategies hypothesis. This was the case across a broad array of instruments that have been used to test the hypothesis that conservatism is a pathogen avoidance strategy, including traditionalism, social dominance orientation, religiosity, political party identification, and explicit endorsements of social and economic conservatism. Nevertheless, inferences based on Studies 1 and 2 might be limited by two aspects of our designs. First, we used only the sexual domain of the TDDS as a measure of sexual strategy. Although this measure includes items that straightforwardly relate to monogamous orientations (e.g., “Bringing someone you just met back to your room to have sex”), it also includes items that are less straightforwardly related to

monogamy (e.g., "Hearing two strangers having sex"). Second, we used only disgust sensitivity instruments to operationalize pathogen avoidance. We sought to address both of these potential limitations in Study 3.

4.Study 3

In addition to measuring the same variables used in Study 1 (i.e., identical conservatism variables and the TDDS), we included the Germ Aversion factor of the Perceived Vulnerability to Disease scale (Duncan et al., 2009) as an additional measure of pathogen avoidance, and the attitudes factor of the revised Sociosexual Orientation Inventory (SOI; Penke & Asendorpf, 2008) as an additional measure of sexual strategies.

4.1.Methods

Participants were 254 adults recruited via Mechanical Turk. Six participants who either did not report their sex or reported being neither male nor female were excluded from all analyses. In the remaining sample (N=248; 150 male; M_{age}=31.92, SD=11.31), seven participants had missing values on no more than three variables. As in Study 2, we imputed these missing values using an EM algorithm. Measures for the study included the pathogen (α=.83) and sexual (α=.85) domains of the TDDS, the three ideology items described in Study 1 (i.e., social conservatism, economic conservatism, and party identification), and the following:

Germ Aversion (Duncan et al., 2009): This is an eight-item measure in which participants were asked to indicate their agreement with statements such as "I prefer to wash my hands pretty soon after shaking someone's hand" on a 1 (strongly disagree) to 7 (strongly agree) scale (α=.76).

SOI (Penke & Asendorpf, 2008): This is a three-item measure of attitudes toward sex outside of a monogamous relationship that is based on Simpson and Gangestad's (1991) SOI.

Participants were asked to indicate their agreement with statements such as "I can imagine myself being comfortable and enjoying 'casual' sex with different partners" on a 1 (strongly disagree) to 7 (strongly agree) scale (α=.87).

4.2. Results

The two pathogen avoidance instruments (Germ Aversion and TDDS pathogen) correlated *r*=.55, and the two sexual instruments (SOI attitudes and TDDS sexual) were similarly correlated, *r*=-.54. Germ aversion and TDDS pathogen had similar relationships with social conservatism (*r*'s=.09 and .11, *p*'s=.15 and .08), economic conservatism (*r*'s=.03 and .11, *p*'s=.03 and .11), and political party identification (*r*'s=.10 and .11, *p*'s=.14 and .09). Sociosexual attitudes and TDDS sexual also had similar relationships with social conservatism (*r*'s=-.23 and .26, *p*'s<.05), economic conservatism (*r* = -.09 and .13, *p*'s=.18 and .05) and political party identification (*r*'s=-.18 and .20, *p*'s<.05).

-- Table 3 here --

-- Table 4 here --

We conducted four path analyses similar to the one described in Study 1. In each model, we (1) regressed one of the two sexual strategy variables on participant sex and one of the two pathogen avoidance variables, and (2) regressed the three ideology variables on participant sex and sexual strategy. As in Study 1, we also allowed the pathogen avoidance variable and participant sex to covary, and we allowed error variances for the three ideology variables to covary. Hence, in all four models, the direct effects of the pathogen avoidance variable on all three ideology variables were constrained to zero; that is, pathogen avoidance was only allowed to relate to conservatism indirectly via sexual strategy. Each model fit the data well, with all S-B χ^2s between 0.89 and 3.22 (*p*'s between .36 and .82), all CFI's equal to 1.00, all RMSEAs

between .00 and .017, and all SRMR's less than or equal to .013. In each model, the indirect effects from the pathogen avoidance to social conservatism via sexual strategies were significant at the .05 level, as were five of eight the indirect effects on economic conservatism and party affiliation (see supplementary materials for effect sizes). Further, in saturated models, all 95% confidence intervals of the direct relationship between pathogen avoidance and conservatism variables overlapped with zero.

4.3.Discussion

In all four combinations of pathogen avoidance and sexual strategies measures, we observed no direct effect of pathogen avoidance on ideological conservatism. That is, any relationship between pathogen avoidance and conservatism was fully mediated by sexual strategies, regardless of which of two instruments of pathogen avoidance were used, and which of two instruments of sexual strategy was used. Hence, results from Study 3 further supported the sexual strategies explanation for the relationship between pathogen avoidance and conservatism.

5.General Discussion

Results were clear and consistent across three studies—although instruments designed to assess pathogen avoidance related to measures of ideological conservatism at a bivariate level, these relationships were fully mediated by instruments measuring sexual strategies. We now briefly describe how these results inform pathogen avoidance and sexual strategies perspectives on ideology, and we discuss directions for future research.

5.1.Pathogen avoidance and ideology

Recent work has highlighted the myriad ways in which human psychology might function to neutralize the infectious disease threats posed by pathogens (Schaller & Park, 2011;

Thornhill & Fincher, 2014). Adopting a conservative ideology—specifically, a socially conservative ideology—has been proposed as an example of a pathogen-neutralizing strategy, either because conservatism inhibits contact with outgroups (Terrizzi et al., 2013), or because departures from traditional norms increase pathogen exposure (Murray et al., 2011; Schaller & Murray, 2012). Results from the current studies seem difficult to reconcile these perspectives. Sensitivity to sexual disgust accounted for 12%, 21%, and 7% of the variance in social conservatism in Studies 1-3, respectively, and sociosexual attitudes accounted for 5% of the variance in social conservatism in Study 3. Hence, there was substantial variance in social conservatism *not* accounted for by sexual strategies in all three studies. If individuals adopt a generally (socially) conservative ideology to reduce exposure to pathogens, it is not clear why this variance in social conservatism *not* accounted for by sexual strategies was unrelated to pathogen avoidance.

We point out that, despite our large samples (N's=819, 238, and 248), it is possible that we failed to detect very small direct effects of pathogen avoidance on conservatism independent of sexual strategies. Future research could replicate these tests to further inform whether sexual strategies partially versus fully mediate the relationship between pathogen avoidance and conservatism. Further, these results cannot rule out the possibility that, even if general dimensions of conservatism do not directly relate to pathogen avoidance, some specific politically-relevant sentiments might have direct anti-pathogen functions. For example, our data do not necessarily rule out the possibility that attitudes toward, say, immigration, relate to pathogen avoidance independent of sexual strategies, perhaps especially in parts of the world where immigration is a more salient issue than in the United States (see, e.g. Brenner and Inbar, 2014) or under conditions of especially high investment in avoiding pathogens (e.g., Faulkner et

al., 2004; Navarrete et al., 2007). Nevertheless, we again point out that we failed to detect any relationship between pathogen avoidance and the sizeable variance in social conservatism that was unaccounted for by sexual strategies in these samples from the United States, where most studies on pathogen avoidance and ideology have been conducted.

5.2.Pathogen avoidance and sexual strategies

Sexual strategies, just like anti-pathogen strategies, affect myriad behaviors. The fact that the two relate to each other presents theoretical and methodological challenges and opportunities. Regarding theory, existing research has suggested that a number of factors shape sexual strategies, including an individual's sex (Buss & Schmitt, 1993), the ratio of men to women in the ecology (Schmitt, 2005), ecological harshness and, hence, survival prospects for offspring lacking strong paternal investment (Gangestad & Simpson, 2000), and ability to convert mating effort into reproductive output (Lukaszewski et al., 2014). Like others before us (Murray et al., 2013; Schaller & Murray, 2008), we suggest that investment in avoiding infectious disease also partially shapes sexual strategies. The empirical patterns observed in this paper and elsewhere are consistent with this proposal. That said, more work (especially modeling work) is needed in this area to understand the relationship between pathogen avoidance and sexual strategies. As one example, relatively restricted sexual strategies might function to avoid specifically sexually transmitted infections, or they might function to avoid pathogens that are transmitted via close, though not necessarily sexual, physical contact. Future empirical tests might inform which of these costs a restricted sexual strategy guards against.

Regarding methods, the current results suggest care in interpreting measures that include both sexual and pathogen content. For example, the original Disgust Scale (Haidt et al., 1994) includes items concerning condemnation of third-party sexual behaviors (e.g., "I think

homosexual activities are immoral"). Although some have suggested that these items increase the validity of the Disgust Scale as a measure of pathogen avoidance (e.g., Terrizzi et al., 2013), such items might inflate estimates of the relationship between pathogen avoidance and a criterion variable (e.g., conservatism) if that criterion variable also relates to sexual strategies. The revision of the Disgust Scale (Olatunji et al., 2007) eliminated the four items from this instrument that were intended to capture sexual disgust during instrument development, but it nevertheless include one item that references sex ("As part of a sex education class, you are required to inflate a new unlubricated condom, using your mouth"). The correlation between conservatism and this individual item with sexual content is markedly higher than that between conservatism and the other items on the revised Disgust Scale (Inbar et al., 2012). Indeed, using measures of pathogen avoidance that were not confounded with sexual strategies, we observed weaker relationships between pathogen avoidance and social conservatism than those reported in a recent meta-analysis (Terrizzi et al., 2013)[1].

Although removing most of the sex-related items from the Disgust Scale was a methodological improvement, it removes the possibility of allowing for separate tests of pathogen avoidance versus sexual strategies hypotheses with a single instrument. In contrast, the TDDS offers an efficient method for doing this, since it has both sexual and pathogen factors (see, e.g., DeBruine et al., 2010, for an example). Other readily available instruments (e.g., the SOI; the PVD Germ Aversion factor) do not confound pathogen and sexual content. Just as our interpretation of the relationship between pathogen avoidance and conservatism changes if we take into account sexual strategies, other findings in the pathogen avoidance literature might similarly be revisited by also examining sexual strategies.

[1] A meta-analysis of the effect sizes of pathogen avoidance and sexual strategies on conservatism within these three studies can be found in the supplementary materials.

505 *5.3.Sexual strategies and ideology*

506 Results lend further support to proposals that sexual strategies relate to ideological
507 conservatism (Kurzban et al., 2010; Weeden & Kurzban, 2014) and that they relate differently to
508 different categories of political sentiments. The difference in the magnitude of the correlations
509 between the sexual domain of the TDDS and different conservatism variables in Study 2, where
510 we measured the most conservatism variables, was striking. Whereas sensitivity to sexual disgust
511 related strongly to religiosity, traditionalism, and social conservatism (*r*'s=.48, .59, and .46,
512 respectively), it related only weakly to social dominance orientation and economic conservatism
513 (*r*'s=.15 and .25, respectively). This is consistent with the hypothesis that moral sentiments (at
514 least partially) function to shape rules that favor individual fitness interests (DeScioli & Kurzban,
515 2013). Whereas rules relevant to how social conservatism is defined in the population from
516 which we sampled (e.g., abortion, recreational drug use) can facilitate or disincentivize sex
517 outside of a pair-bond, rules relevant to how economic conservatism is defined (e.g., progressive
518 taxation, economic aid to the poor) presumably have less influence on individuals' ability to
519 pursue their sexual strategies.

520 *5.4.Concluding remarks*

521 The fact that pathogen avoidance relates to political ideology has been established in the
522 literature. The time now seems ripe to move on to second-generation topics—such as generating
523 and testing competing accounts of why this relationship exists. We hope that these studies
524 contribute to a clearer understanding of the relationship between sexual strategies, pathogen
525 avoidance, and political ideology.

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700 Figure Caption

701 Figure 1. Model constraining the direct relationship between pathogen avoidance and political

702 variables to zero, S-B $\chi^2(3) = 1.56$, $p = .67$, CFI = 1.00, RMSEA = .00, SRMR < .01.Error

703 variances for the three political variables are allowed to covary.

Table 1. Study 1 (N=819) bivariate correlations (*r*) and standardized regression coefficients, (β) unstandardized regression coefficients (*b*), and 95% confidence intervals between conservatism variables, pathogen disgust, and sexual disgust in the saturated model.

	Pathogen TDDS				Sexual TDDS			
	r	β	*b*	95% CI	*r*	β	*b*	95% CI
Social conservatism	.16	-0.01	-0.01	-0.22 -- 0.10	.34	0.42	0.46	0.37 -- 0.55
Economic conservatism	.09	0.02	0.03	-0.09 -- 0.14	.16	0.23	0.24	0.14 -- 0.33
Party affiliation	.08	-0.02	-0.03	-0.13 -- 0.08	.19	0.28	0.29	0.19 -- 0.38

Table 2. Study 2 (N=238) bivariate correlations (*r*) and standardized regression coefficients, (β) unstandardized regression coefficients (*b*), and 95% confidence intervals between conservatism variables, pathogen disgust, DS-R, and sexual disgust in the saturated models. Sexual disgust values left of the slash refer to the model in which pathogen disgust is used to operationalize pathogen avoidance, and values right of the slash refer to the model in which the DS-R is used to operationalize pathogen avoidance.

	Pathogen TDDS				DS-R				Sexual TDDS			
	r	β	*b*	95% CI	*r*	β	*b*	95% CI	*r*	β	*b*	95% CI
Right/Left	.19	-0.04	-0.07	-0.35 -- 0.22	.23	0.08	0.30	-0.27 -- 0.88	.36	0.49/ 0.43	0.78/ 0.68	0.53 -- 1.03 / 0.44 -- 0.92
Political ideology	.22	-0.03	-0.04	-0.23 -- 0.14	.22	0.03	0.07	-0.29 -- 0.44	.41	0.53/ 0.49	0.55/ 0.51	0.44 – 0.66 / 0.35 -- 0.66
Social conservatism	.23	-0.06	-0.08	-0.26 -- 0.09	.22	.00	.00	-0.37 -- 0.36	.46	0.67/ 0.57	0.31/ 0.62	0.14 – 0.48 / 0.46 -- 0.78
Economic conservatism	.15	.00	.00	-0.24 -- 0.23	.14	0.01	0.02	-0.38 -- 0.43	.25	0.27/ 0.26	0.66/ 0.31	0.46 – 0.86 / 0.13 -- 0.49
Traditionalism	.25	-0.17	-0.20	-0.35 -- -0.06	.36	0.09	0.21	-0.07 -- 0.49	.59	0.80/ 0.65	0.78/ 0.65	0.65 – 0.91 / 0.51 -- 0.78
SDO	.08	-0.01	-0.01	-0.16 -- 0.14	.13	0.09	0.16	-0.12 -- 0.44	.15	0.26/ 0.21	0.20/ 0.16	0.07 – 0.33 / 0.04 -- 0.28
Religiosity	.26	-0.04	-0.01	-0.05 -- 0.03	.34	0.13	0.08	.00 -- 0.17	.48	0.56/ 0.47	0.15/ 0.13	0.11 – 0.18 / 0.09 -- 0.17

Table 3

Study 3 (N=248) bivariate correlations (*r*) and standardized regression coefficients, (β) unstandardized regression coefficients (*b*), and 95% confidence intervals between conservatism variables, pathogen disgust, PVD germ aversion, and sexual disgust in the saturated models. Sexual disgust values left of the slash refer to the model in which pathogen disgust is used to operationalize pathogen avoidance, and values right of the slash refer to the model in which PVD germ aversion is used to operationalize pathogen avoidance.

	TDDS Pathogen				PVD Germ Aversion				TDDS Sexual			
	r	β	*b*	95% CI	*r*	β	*b*	95% CI	*r*	β	*b*	95% CI
Social conservatism	.10	-0.07	-0.11	-0.27 -- 0.09	.10	0.02	0.03	-0.17 – 0.22	.26	0.39 / 0.35	0.46 / 0.42	0.29 -- 0.65 / 0.27 -- 0.56
Economic conservatism	.10	0.02	0.03	-0.20 – 0.25	.05	0.00	0.00	-0.22 – 0.22	.12	0.21 / 0.23	0.26 / 0.28	0.09 -- 0.45 / 0.13 -- 0.43
Party affiliation	.10	-0.02	-0.04	-0.24 – 0.18	.11	0.04	0.07	-0.15 – 0.29	.20	0.29 / 0.27	0.36 / 0.33	0.16 -- 0.56 / 0.16 -- 0.50

Table 4

Study 3 (N=248) bivariate correlations (*r*) and standardized regression coefficients, (β) unstandardized regression coefficients (*b*), and 95% confidence intervals between conservatism variables, pathogen disgust, PVD germ aversion, and sociosexuality in the saturated models. SOI values left of the slash refer to the model in which pathogen disgust is used to operationalize pathogen avoidance, and values right of the slash refer to the model in which PVD germ aversion is used to operationalize pathogen avoidance.

	TDDS Pathogen				PVD Germ Aversion				SOI			
	r	β	*b*	95% CI	*r*	β	*b*	95% CI	*r*	β	*b*	95% CI
Social conservatism	.10	0.07	0.11	-0.08 – 0.29	.10	0.07	0.11	-0.08 – 0.29	-.23	-0.27 / -0.27	-0.18 / -0.18	-0.26 -- -0.10 / -0.26 -- -0.10
Economic conservatism	.10	0.10	0.10	-0.09 – 0.31	.05	0.04	0.07	-0.13 – 0.27	-.09	-0.14 / -0.15	-0.09 / -0.10	-0.18 -- -0.01 / -0.18 -- -0.01
Party affiliation	.10	0.08	0.13	-0.06 – 0.34	.11	0.08	0.13	-0.07 – 0.34	-.18	-0.22 / -0.21	-0.15 / -0.15	-0.23 -- -0.06 / -0.23 -- -0.06